



The College of Graduate Studies and the College of Engineering Cordially Invite You
to a

Master Thesis Defense

Entitled

*MATERIAL CHARACTERIZATION FOR MICROWAVE ABSORBING AND SHIELDING
APPLICATIONS*

by

Muhammed Shafeeque Kallumottakkal

Faculty Advisor

Dr. Mousa Hussein, Department of Electrical Engineering
College of Engineering

Date & Venue

11 AM

Thursday, 18 November 2021

Room 1164, F1 Building

Abstract

The rapid advancement and wide spread of microwave and RF-communication systems have contributed to an abundant rise in electromagnetic energy radiation in our living environment. Such an increase in microwave sources is due to the development and advancement in communication techniques (mobile phones, laptops, and antennas for aeronautics or automobile) and electronic warfare in the military field (radar and satellite). To address these concerns, EM absorbing materials are used to ensure public safety as well as the safety of military operations. Various types of EM absorbing materials made up of composite materials have been produced and studied. In this thesis, we discuss the microwave properties of different sets of composite materials. Firstly, the samples of polymer with different weight concentrations (wt. %) (1%,5%,8% and 10%) of Multi-Wall Carbon Nanotube (MWCNT) are studied, and secondly the CNT sample is functionalized with metal alloy oxides, such as Cobalt oxide, Cobalt Iron oxide Iron oxide in three different concentrations (5%, 10%, and 20%) and embedded in a polyurethane matrix are investigated. The dielectric properties of the samples are studied using an open-ended coaxial probe technique in the frequency range (5 - 50 GHz) and the Reflection loss is calculated for single and double-layer structure. These functionalized composites can be used as a lightweight material for microwave absorption and shielding.

Keywords: Functionalized CNT, Microwave Absorption, dielectric